WHAT IS CLAIMED IS:

1. An electron beam drawing mask blank comprising:

a pattern supporting layer for transmitting an electron beam therethrough;

an electron beam scattering layer formed over said pattern supporting layer; and

a support member for supporting said pattern supporting layer and said electron beam scattering layer,

wherein said electron beam scattering layer is made of a material composed substantially of the carbon element and/or the silicon element.

2. An electron beam drawing mask blank as claimed in claim 1, wherein said electron beam scattering layer is made of a material composed substantially of the carbon element.

3. An electron beam drawing mask blank as claimed in claim 2, wherein said electron beam scattering layer is made of either a diamond like carbon or a material containing a diamond like carbon doped with at least one of B, N, Si and P.

4. An electron beam drawing mask blank as claimed in claim 3, wherein the doping of said diamond like carbon with at least one of B, N, Si and P is 0.1 to 40 mole %.

5. An electron beam drawing mask blank as claimed in claim 1, wherein said electron beam scattering layer is made of a material composed substantially of the silicon element.

6. An electron beam drawing mask blank as claimed in any of the claims 1 to 5, wherein said pattern supporting layer is made of a material composed substantially of the carbon element.

7. An electron beam drawing mask blank as claimed in claim 6, wherein said pattern supporting layer is made of either a diamond like carbon or a material containing a diamond like carbon doped with at least one of B, N, P, Ti, Si and Al.

8. An electron beam drawing mask blank as claimed in claim 7, wherein the doping of said diamond like carbon with at least one of B, N, P, Ti, Si and Al is 0.1 to 40 mole %.

9. An electron beam drawing mask blank as claimed in any of the claims 1 to 5, wherein said pattern supporting layer is made of a material composed substantially of the silicon element.

~~10.~~ An electron beam drawing mask blank as claimed in any of the claims 1 to 9, further comprising an etching stopper layer sandwiched either between said electron beam scattering layer and said pattern supporting layer or between said pattern supporting layer and said support member.

11. An electron beam drawing mask blank as claimed in claim 10, wherein said etching stopper layer is made of a material having a high etching selection ratio with said electron beam scattering layer and/or said support member.

~~12. An electron beam drawing mask blank as claimed in any of the~~ claims 1 to 11, wherein said support member is ~~made of a material~~ composed substantially of the carbon element.

13. An electron beam drawing mask blank comprising:

a pattern supporting layer for transmitting an electron beam therethrough;

an etching stopper layer formed over said pattern supporting layer;

an electron beam scattering layer formed over said etching stopper layer; and

a support member for supporting said pattern supporting layer, said etching stopper layer and said electron beam scattering layer,

wherein said electron beam scattering layer is made of either a diamond like carbon or a material containing a diamond like carbon doped with at least one of B, N, Si and P;

said pattern supporting layer is made of either a diamond like carbon or a material containing a diamond like carbon doped with at least one of B, N, P, Ti, Si and Al; and

said etching stopper layer is made of a material having a high etching selection ratio with said electron beam scattering layer.

14. An electron beam drawing mask blank comprising:

a pattern supporting layer for transmitting an electron beam therethrough;

an electron beam scattering layer formed over said pattern supporting layer; and

a support member for supporting said pattern supporting layer and said electron beam scattering layer,

wherein said pattern supporting layer has a film thickness of 0.005 to 0.2 micron whereas said electron beam scattering layer has a film thickness of 0.2 to 2 micron so that they are made of materials satisfying these film thickness relations.

15. An electron beam drawing mask blank as claimed in claim 14, wherein said pattern supporting layer satisfies the following Formula (1):

$$Tt \leq 2\alpha \qquad (1),$$

wherein Tt indicates the film thickness of the pattern supporting layer; and α indicates a mean free path of electrons in the pattern supporting layer.

16. An electron beam drawing mask blank as claimed in claim 14 ~~or 15~~, wherein said electron beam scattering layer satisfies the following

Formula (2):

$$2\beta \leq Ts \leq 10\beta \qquad (2),$$

wherein Ts indicates the film thickness of the electron beam scattering layer; and β indicates a mean free path of electrons in the electron beam scattering layer.

17. An electron beam drawing mask blank as claimed in any of the claims 14 ~~to 16~~ or 15, wherein said pattern supporting layer and said electron beam scattering layer have film material densities of 1.0 to 5.0 g/cm^3.

18. An electron beam drawing mask blank as claimed in any of the claims 14 to ~~17~~ 16, wherein said pattern supporting layer and/or said electron beam scattering layer have elastic moduli of 0.8×10^{11} Pa or higher.

19. An electron beam drawing mask blank as claimed in any of the claims 14 to ~~18~~ 16, wherein said pattern supporting layer and/or said electron beam scattering layer have a film thickness dispersion of 30 % or less within one shot area.

20. An electron beam drawing mask blank as claimed in any of the claims 14 to ~~19~~ 16, wherein said electron beam scattering layer is made of a material composed substantially of the carbon element and/or the silicon element.

21. An electron beam drawing mask blank as claimed in any of the claims 14 to ~~20~~ 16, further comprising an etching stopper layer sandwiched either between said electron beam scattering layer and said pattern supporting layer or between said pattern supporting layer and said support member.

22. An electron beam drawing mask blank as claimed in claim 21, wherein said etching stopper layer has a film thickness of 0.005 to 0.2 micron.

23. An electron beam drawing mask blank as claimed in claim 21 ~~or 22~~, wherein said etching stopper layer has a film material density of 1.0 to 5.0 g/cm^3.

24. An electron beam drawing mask blank as claimed in ~~any of the claims 21 to 23~~ claim 21, wherein said etching stopper layer is made of a material having a high etching selection ratio with said electron beam scattering layer and/or said support member.

25. An electron beam drawing mask blank as claimed in any of the claims 14 to ~~24~~ 16, wherein at least one layer of said pattern supporting layer, said etching stopper layer and said electron beam scattering layer has a surface roughness (Ra) of 10 nm or lower.

26. An electron beam drawing mask blank as claimed in any of the claims 14 to ~~25~~ 16, wherein either at least one layer of said pattern supporting layer, said etching stopper layer and said electron beam scattering layer is stress-controlled by a heat treatment, or at least two layers are simultaneously subjected to a heat treatment to control the film stress thereby to reduce the total film stress.

27. ~~An electron beam drawing mask , manufactured by using the mask blank as claimed any of the claims 1 to 26~~

28. An electron beam drawing mask comprising:

a pattern supporting film for transmitting an electron beam therethrough;

an electron beam scattering body pattern formed over said pattern supporting film; and

a support member for supporting said pattern supporting film and said electron beam scattering body pattern,

wherein said pattern supporting film has a film thickness of 0.005 to 0.2 micron, a film material density of 1.0 to 5.0 g/cm^3 and an elastic modulus of 0.8 x 10^{11} Pa or higher; and

said electron beam scattering body pattern has a film thickness of 0.2 to 2 micron, a film material density of 1.0 to 5.0 g/cm^3, and an elastic modulus of 0.8 x 10^{11} Pa or higher.

29. An electron beam drawing mask comprising:

a pattern supporting film for transmitting an electron beam therethrough;

an electron beam scattering body pattern formed over said pattern supporting film; and

a support member for supporting said pattern supporting film and said electron beam scattering body pattern,

wherein at least one of said support member, said pattern supporting film and said electron beam scattering body pattern is made of a material composed substantially of the carbon element.

30. An electron beam drawing mask comprising:

a pattern supporting film for transmitting an electron beam therethrough;

an electron beam scattering body pattern formed over said pattern supporting film;

an etching stopper layer formed all over said pattern supporting film or left under said electron beam scattering body pattern; and

a support member for supporting said pattern supporting film, said etching stopper layer and said electron beam scattering body pattern,

wherein said electron beam scattering body pattern is made of either a diamond like carbon or a material containing a diamond like carbon doped with at least one of B, N, Si and P;

said pattern supporting film is made of either a diamond like carbon or a material containing a diamond like carbon doped with at least one of B, N, P, Ti, Si and Al; and

said etching stopper layer is made of a material having a high etching selection ratio with said electron beam scattering layer.

31. An electron beam drawing mask comprising:

a pattern supporting film for transmitting an electron beam therethrough;

an electron beam scattering body pattern formed over said pattern supporting film; and

a support member for supporting said pattern supporting film and said electron beam scattering body pattern,

wherein: said electron beam scattering body pattern is made of a material composed substantially of the silicon element; and

said pattern supporting film is made of SiC or TiC.

32. An electron beam drawing mask comprising:

a pattern supporting film for transmitting an electron beam therethrough;

an etching stopper layer formed over said pattern supporting film;

an electron beam scattering body pattern formed over said etching stopper layer; and

a support member for supporting said pattern supporting film, said etching stopper layer and said electron beam scattering body pattern,

wherein said electron beam scattering body pattern is made of hard carbon;

said etching stopper layer is made of SiO_2; and

said pattern supporting film is made of a material composed substantially of the silicon element.

33. An electron beam drawing mask comprising:

a pattern supporting film for transmitting an electron beam therethrough;

an electron beam scattering body pattern formed over said pattern supporting film; and

a support member for supporting said pattern supporting film and said electron beam scattering body pattern,

wherein said electron beam scattering body pattern is made of either a diamond like carbon or a material containing a diamond like carbon doped with at least one of B, N, Si and P;

said pattern supporting film is made of β-SiC.

34. An electron beam drawing mask comprising:

a pattern supporting film for transmitting an electron beam therethrough;

an electron beam scattering body pattern formed over said pattern supporting film; and

a support member for supporting said pattern supporting film and said electron beam scattering body pattern,

wherein said electron beam scattering body pattern is made of a material composed substantially of the silicon element; and

said pattern supporting film is made of SiC.

35. An electron beam drawing mask comprising:

a pattern supporting film for transmitting an electron beam therethrough;

an electron beam scattering body pattern formed over said pattern supporting film; and

a support member for supporting said pattern supporting film and said electron beam scattering body pattern,

wherein said electron beam scattering body pattern is made of a material composed substantially of the silicon element; and

said pattern supporting film is made of either a diamond like carbon or a material containing a diamond like carbon doped with at least one of B, N, P, Ti, Si and Al.

36. An electron beam drawing mask as claimed in any of the claims 28 ~~27~~ to 35, wherein said electron beam drawing mask is used at an acceleration voltage of an exposure electron beam of 30 KeV or higher.

37. A method for manufacturing an electron beam drawing mask, comprising the step of forming at least one of a compressive stress film and a tensile stress film on the surface side or back side of the electron beam drawing mask as claimed in any of the claims 27 to 35 ~~36~~.

38. A method for manufacturing an electron beam drawing mask, comprising the steps of subjecting an SIMOX wafer or an adhered SOI wafer to a wind treatment from the back side; subsequently removing a stopper layer (or an intermediate layer) in the wafer selectively; and forming a pattern supporting film on one side from the back side by a thin film forming method.

39. A semiconductor device, manufactured by using an electron beam drawing mask as claimed in any of the claims 27 to ~~36~~ 35.

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